

**WHAT IS CLAIMED IS:**

1. A matrix switch comprising:

an input port for splitting a plurality of virtual output queues (VOQs) into a plurality of VOQ groups, and inputting them;

5 a plurality of crossbar switch units for independently arbitrating the input VOQ groups, and outputting cells; and

a plurality of output ports for independently arbitrating the cells output from the crossbar switch units, and transmitting the cells to the output ports.

2. The matrix switch of claim 1, wherein part of the crossbar switch  
10 units form a plurality of switch modules, and

the switch module further comprises a buffer for storing a predetermined cell in the output port of the crossbar switch unit.

3. The matrix switch of claim 1, wherein  $n$  VOQs are separated into  $L$  VOQ groups when  $N$  VOQs are provided,

15 the switch module comprises  $L$  crossbar switch units,

the matrix switch comprises  $L$  switch modules, and

$L=N/n$  where  $N$ ,  $L$ , and  $n$  are natural numbers.

4. The matrix switch of claim 3, wherein the crossbar switch unit  
comprises  $n$  distributed grant arbiters,  $n$  distributed accept arbiters, and a  
20 crossbar switch controller,

the grant arbiter receives an  $n$ -bit request signal vector from the VOQ, and transmits an  $n$ -bit grant signal vector to the accept arbiter, and

the accept arbiter receives the  $n$ -bit grant signal vector, and transmits an  $n$ -bit accept signal vector to the crossbar switch controller.

5. The matrix switch of claim 4, wherein the matrix switch further comprises a buffer controller and an output arbiter,

the buffer controller checks the buffer's state, and transmits request signals to the output arbiter when a cell is provided in the buffer, and

5 the output arbiter selects one of the transmitted request signals, and transmits an accept to the crossbar switch unit.

6. An arbitration method of a matrix switch including a plurality of input ports, a plurality of crossbar switch units, a buffer, and a plurality of output ports, comprising:

10 (a) a grant arbiter of the crossbar switch unit searching for request signals transmitted from the input ports, and selecting the first-requested input port;

(b) determining whether a buffer of the output port corresponding to the grant arbiter can receive an additional cell;

15 (c) transmitting a grant signal to the input port when the buffer can receive the cell;

(d) an accept arbiter of the crossbar switch unit selecting the first-granted grant signal of the grant signals; and

20 (e) the accept arbiter transmitting an accept signal to the output port corresponding to the selected grant signal.

7. The arbitration method of claim 6, further comprising:

(f) an output arbiter of the output port searching for the request signals transmitted from the crossbar switch unit to select the first-requested crossbar switch unit; and

(g) the output arbiter transmitting an accept signal to the selected crossbar switch unit.

8. The arbitration method of claim 6, wherein the searching is performed from the predefined highest priority value using the round robin in (a),  
5 (d), and (f).

9. The arbitration method of claim 8, wherein (c) further comprises updating the new highest priority value based on port information of the selected output port, and storing the value in a register, when the accept arbiter has received a grant signal; and

10 (e) further comprises updating the highest priority value based on information on the corresponding crossbar switch unit, and storing the value in the register, when the output arbiter has transmitted the accept signal to the crossbar switch unit.

10. The arbitration method of claim 9, wherein the accept arbiter  
15 updates the preset highest priority ranking value by adding 1 to output port information matched with a grant signal, and

the accept arbiter updates the highest priority ranking value preset to the grant arbiter and the output arbiter by adding 1 to input port information and crossbar switch unit information corresponding to the accept signal.